

Electrical Blog – Electric Fuses

Fuse is one of the oldest forms of overcurrent protection device which consists of a metal wire or strip(s) that melts to open the electrical circuit when excessive current flows. The fuse operating time depends on the current magnitude.

Fuses have a wide range of applications – low-voltage 13A plug fuses for small electrical appliances and high voltage fuses for capacitor banks/transformers in power system. Several decades ago, fuses were commonly used to protect the electrical installation in homes in Hong Kong. The general impression is that they are simple devices and some people might replace it by themselves when a fuse blown. This could be dangerous especially in cases where the fuse operation was caused by a short-circuit fault which had not been isolated before the new one was inserted. Also, the replacement fuse might not be of proper rating / type and the effectiveness could be affected.

Fuses have different constructions (e.g. glass tube, ceramic case.), fusible elements (e.g. silver, copper or tin) and filling materials, as well as various time-current characteristics, current / voltage ratings and fault interrupting capacities. Fuses are less expensive and requiring minimal maintenance when compared with other protection equipment. Some types of fuse also have current-limiting capability which enables the fuse to clear a heavy fault in less than one cycle and limit the fault current magnitude and the total let-through energy.

Fuses have their limitations – they are not re-usable; they can only sense overcurrent and cannot be used to protect against earth fault with small fault current; their time-current characteristics are not very accurate. Depending on the applications, electrical engineers may prefer using other equipment such as miniature circuit breakers, moulded case circuit breakers, residual current devices, switchgear together with electrical relays rather than fuses to protect the electrical circuits.

The Electrical Blog is contributed by the Electrical Division. If you would like to know more about this topic, please contact the Division Hon Secretary, Ir Simon Chung at simon.chung@arup.com